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METHOD AND APPARATUS FOR DETERMINING A DATA RATE IN A HIGH RATE PACKET DATA WIRELESS COMMUNICATIONS SYSTEM

CLAIM OF PRIORITY UNDER 35 U.S.C. §120

The present Application for patent is a Continuation and claims priority to patent application Ser. No. 09/697,372 entitled "Method and Apparatus for Determining a Data Rate in a High Rate Packet Data Wireless Communications System" filed Oct. 25, 2000, now U.S. Patent No. 6,973,098, and assigned to the assignee hereof and hereby expressly incorporated by reference herein.

REFERENCE TO RELATED CO-PENDING APPLICATIONS FOR PATENT

The present invention related to the following U.S. Application for patent:

U.S. Patent Application No. 08/963,386 entitled "METHOD AND APPARATUS FOR HIGH RATE PACKET DATA TRANSMISSION," filed on Nov. 3, 1997, now U.S. Pat. No. 6,574,211, issued Jun. 3, 2003 to Padovani et al., and assigned to the assignee hereof which is hereby expressly incorporated by reference herein; and to:

U.S. Patent Application No. 09/697,375, filed Oct. 25, 2000, now U.S. Patent No. 7,068,683, entitled METHOD AND APPARATUS FOR HIGH RATE PACKET DATA AND LOW DELAY DATA TRANSMISSIONS, and assigned to the assignee hereof.

FIELD

The present invention relates to wireless data communication. More particularly, the present invention relates to a novel and improved method and apparatus for high speed packet data and low delay data transmissions in a wireless communication system.

BACKGROUND

Increasing demand for wireless data transmission and the expansion of services available via wireless communication technology has led to the development of specific data services. One such service is referred to as High Data Rate (HDR). An exemplary HDR type system is proposed in "TL80-54421-1 HDR Air Interface Specification" referred to as "the HAI specification." HDR generally provides an efficient method of transmitting packets of data in a wireless communication system. A difficulty arises in applications requiring both voice and packet data services. Voice systems are considered low delay data systems, as the voice communications are interactive and therefore processed in real-time. Other low delay data systems include video, multi-media, and other real-time data systems. HDR systems are not designed for voice communications but rather are designed to optimize data transmissions, as the base station in an HDR system circulates through the various mobile users, sending data to only one mobile user at a time. The circulation introduces delay into the transmission process. Such delay is tolerable for data transmission, as the information is not used in real-time. In contrast, the circulation delay is not acceptable for voice communications.

There is a need for a combination system for transmitting high speed packet data information along with low delay data,

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such as voice information. There is a further need for a method of determining the data rate for high packet data rate information in such a combination system.

SUMMARY

The disclosed embodiments provide a novel and improved method for high packet data rate and low delay data transmission in a wireless communication system. In one embodiment, a base station in a wireless communication system first sets up low delay data transmission, effectively as high priority, and then schedules packet data services according to the available traffic power after satisfying the low delay data. The packet data service transmits the packet data to one mobile user at a time. Alternate embodiments may provide packet data to multiple mobile users at a time, dividing the available power among the multiple users. At a given time, one user is selected as a target recipient based on the quality of the channel. The base station determines a ratio of the available power to the pilot channel power and provides the ratio to the selected mobile user. The ratio is referred to as the "Traffic-to-Pilot" ratio, or "T/P" ratio. The mobile user uses the ratio to calculate a data rate and sends that information back to the base station.

In one embodiment, the base station provides a "Broadcast-to-Pilot" ratio, or "B/P" ratio to the mobile user, wherein the ratio considers the broadcast power, i.e., the total available transmission power, of the base station and the pilot power, i.e., the power portion of the broadcast power used for the pilot channel. The mobile user determines a normalized data rate to request from the base station, wherein the normalized data rate is a function of the B/P. The normalized data rate is sent to the base station and a decision made as to the appropriate data rate. The data rate selection is then sent to the mobile user.

In an exemplary embodiment, a parallel signaling channel is used to provide the T/P ratio information to the mobile user. The parallel signaling channel may be implemented using a separate carrier frequency, or by any of a variety of methods for generating a separate channel.

According to another embodiment, the T/P ratio is provided via the packet data traffic channel, wherein the T/P ratio is included in the header of a packet of data, or is provided continuously along with the packet data.

Alternate embodiments may implement another metric for estimating a SNR of the traffic channel based on the SNR of the pilot channel, wherein the metric is provided to the mobile user for determination of a data rate. The mobile user requests transmissions at or below the determined data rate.

In one aspect a wireless communication apparatus includes a first processor operative to receive a first indicator, the first indicator corresponding to available packet data transmission power; and a correlation unit operative to determine a packet data transmission rate indicator as a function of the first indicator and a received pilot signal strength.

In another aspect, in a wireless communication system, the system operative for transmitting packet data and low delay data, the system having a total available transmit power, a method includes establishing at least one low delay communication link using a first power; determining available packet data traffic power as a function of the total available transmit power and the first power; determining a packet data rate based on the available packet data traffic power.

In still another aspect, a wireless communication apparatus includes a first processor operative to receive a first indicator, the first indicator corresponding to a ratio of available traffic-to-pilot signal strength; a measurement unit operative to